

NACIS: World Wide Web Access to Computerized Patient Records

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Computerized Patient Record (CPR) systems are being implemented at many institutions. These systems have significant advantages over traditional paper record systems, including the capability of simultaneous access from multiple locations, multiple ways of organizing and displaying information, and the ability to integrate computerized decision support tools into the record system and the workflow of the clinician. Many different CPR systems are now available and in use, including systems developed "in-house" by and for a specific institution, as well as an increasing number of commercially available systems.

The University of Utah began development of the ACIS (Advanced Clinical Information System) CPR system in July 1993. The system is based on a client-server architecture. A clinical data repository is implemented using an OracleTM relational database. The user interface was initially implemented as a Visual BasicTM application, called "Chart", which communicates with the data repository via ODBC over a local area network. This interface has been in production use at the University Hospital and many of its associated outpatient clinics since July 1994.

As is typical for most client-server systems, the "Chart" program resides and is executed on individual client PC workstations. This arrangement has proven quite functional, but does have problems and limitations. The most significant problem is in user support. It is necessary to maintain the proper configuration on each workstation, and to simultaneously update hundreds of workstations whenever a new version of the program is released.

Given these considerations and the increasing popularity of World Wide Web technology, it was decided to develop an alternative Web-based user interface. With this paradigm, each individual workstation needs only to run a standard Web browser (typically NetscapeTM at our institution). This dramatically simplifies support, especially as changes in the program can be implemented as needed, requiring updates only on the Web server.

There is no need for updating individual workstations, except when the browsers themselves need to be updated in order to display content written using new HTML features, which happens infrequently.

Development of the new interface, called NACIS ("Net ACIS"), began in August 1995. Initial production use began in January 1996. The system is hosted on a Netscape Enterprise Web server. Communication with the data repository is implemented using custom CGI scripts written in Perl, with OraPerl extensions. The NACIS interface allows users to enter data into the patient record, as well as retrieve it. The server is protected by a firewall and access is restricted to specific registered IP addresses, in order to minimize any possibility of unauthorized access to patient information.

A few areas of the hospital have adopted NACIS as their primary interface to the patient record, in preference to the standard "Chart" program. This is in part due to the fact that the flexibility of the Web technology has allowed several new features to be added in advance of their implementation in "Chart." One of these features that has proven useful is the "Key Analytes Display." This allows display and trending of multiple sets of lab values, customized to the needs of the particular unit, such as the Newborn ICU, Burn Unit, Surgical ICU, and Medical ICU.

Another new feature not available in the standard interface is a "Billing Summary," which calculates the correct CPT Evaluation and Management billing code for a particular visit, based on the levels of history, physical examination and medical decision making entered by the user. Users can also obtain help in coding, if needed, by accessing descriptions of the criteria for these levels, as published in CPT.

We feel that the NACIS interface to our CPR system, using World Wide Web technology, provides a very viable alternative to the standard client interface, with the advantages of additional flexibility and greatly simplified user support.